P.R. 131

HASKELL SAND CORE

FROM THE CORYVILLE POOL, MCKEAN COUNTY, PENNSYLVANIA

(Preliminary Report)

by

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Commonwealth of Pennsylvania
Department of Internal Affairs
William S. Livengood, Jr., Secretary

Topographic and Geologic Survey
Ralph W. Stone, State Geologist

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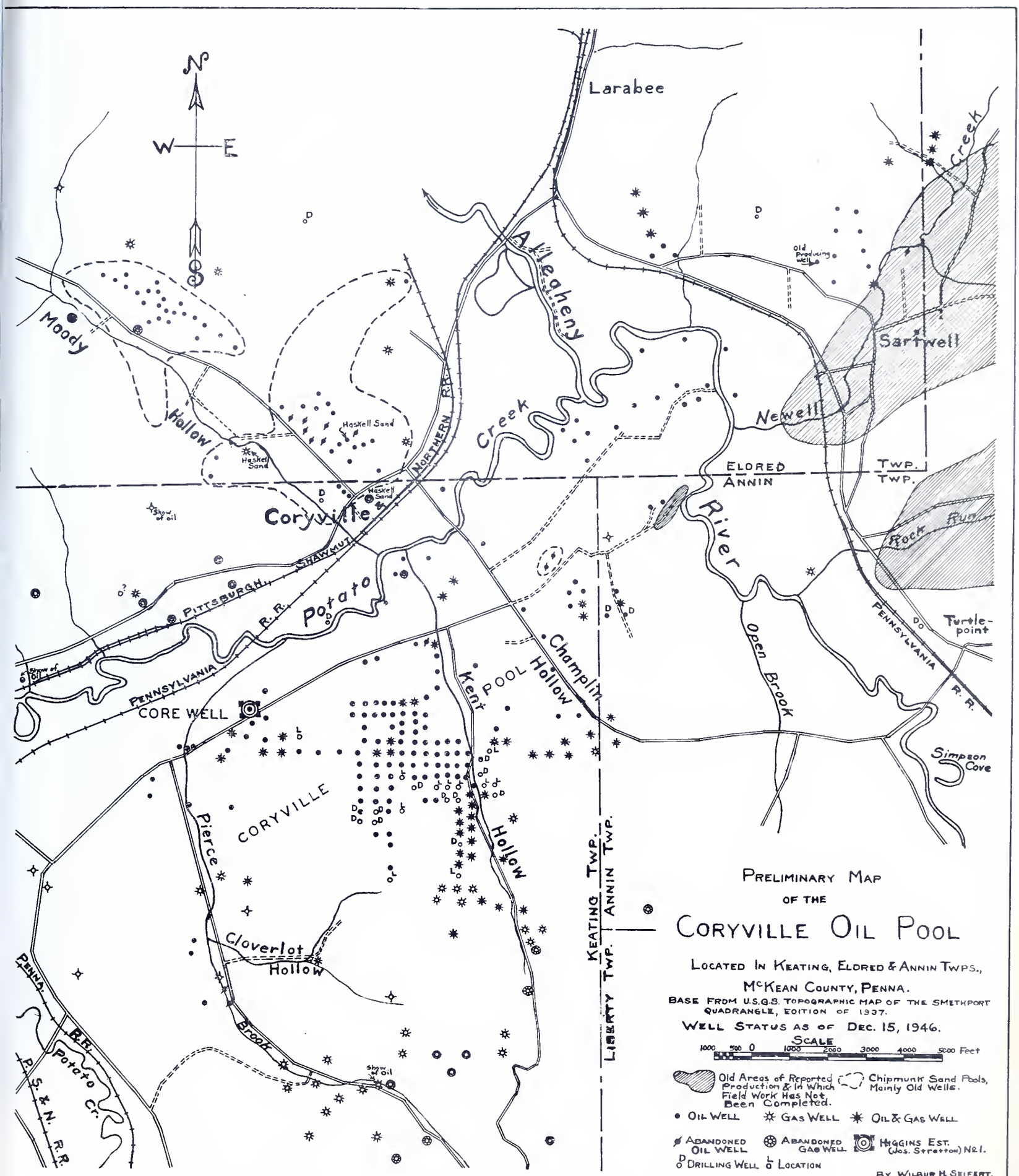
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF INTERNAL AFFAIRS
WILLIAM S. LIVENGOOD, JR., SECRETARY

TOPOGRAPHIC AND GEOLOGIC SURVEY
RALPH W STONE, STATE GEOLOGIST



PRELIMINARY MAP
OF THE

CORYVILLE OIL POOL

LOCATED IN KEATING, ELDRED & ANNIN TWPS.,
McKEAN COUNTY, PENNA.

BASE FROM U.S.G.S. TOPOGRAPHIC MAP OF THE SMETHPORT QUADRANGLE, EDITION OF 1937.

WELL STATUS AS OF DEC. 15, 1946.

SCALE
1000 500 0 1000 2000 3000 4000 5000 Feet

Old Areas of Reported Production & In Which Field Work Has Not Been Completed.

Chipmunk Sand Pools, Mainly Old Wells.

• OIL WELL ✲ GAS WELL ✲ OIL & GAS WELL

ABANDONED OIL WELL ABANDONED GAS WELL HIGGINS EST. (Jos. Stratton) No. 1.

D DRILLING WELL L LOCATION

BY WILBUR H. SEIFERT.

Haskell Sand Core

from the Coryville Pool, McKean County, Pennsylvania

(Preliminary Report)

A discovery of oil in the Haskell sand on the John Tanner farm in Kent Hollow, near Coryville, Keating Township, McKean County, made by G. E. Olsen in 1945, has resulted in the development of an oil pool of significant size in the eastern part of McKean County. The new pool is only a short distance southwest of an old small Haskell sand oil pool at the mouth of Potato Creek along the Allegheny Valley, and there is a possibility that further drilling may show that the two are connected.

The discovery was intensively exploited during 1946. Outside the water-flooding territory in the northern oil district of Pennsylvania, the area was the scene of the greatest drilling activity in the State in 1946. The pool, as now developed, includes approximately 1800 acres and 155 oil wells have been completed in it. A number of the wells have had initial productions of 25 to 30 barrels per day, but the majority quickly settle to 2 to 15 barrels on the pump and some of the marginal ones to less than one barrel. The average daily production of the pool at the close of 1946 is reported to be 800 barrels, *

The pool is located on the northwest flank of the Smethport anticline. The Haskell sand, which lies about 400 feet below the top of the Bradford Third sand, appears to pinch out down dip. The same or a closely related sand has produced gas for many years in the Open Brook gas pool on the crest of the anticline to the southeast. In the better parts of the pool, the pay sand has a thickness of 15 to 20 feet. Its permeability is low.

The Pennsylvania Geological Survey is at present making a study of the Haskell sand along the Guffey-Coryville trend. In connection with this work, a Baker cable-tool core was taken during the summer of 1946 of the Haskell sand on the Higgins Estate No.1 well of Fralich and Stengel. The well is located in the southwestern part of the Coryville pool about 6500 feet southwest of Coryville. E. M. Tignor of the Franklin Field Office of the United States Bureau of Mines has made permeability, porosity and oil saturation determinations on samples of the sand selected by Messrs. William S. Lytle, Jr., and Wilbur H. Seifert who supervised the taking of the core. Inasmuch as it will probably take another six months to complete the final report on the area, the core data are being released at this time in the form of a preliminary report accompanied by a map.

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*At the time of the second printing of this report in March 1947, the average daily production was authoritatively reported to be about 450 barrels.

Section of Haskell Sand in Higgins Estate No. 1 Well

of Fralich and Stengel,

Coryville Pool, Keating Township, McKean County, Pa.

(From core measurements made by Wilbur H. Seifert)

Thickness Feet	Description of strata	Depth in feet Top	Bottom
.80	Shale, gray	1631.50-	1632.30
.03	Sandstone, very fine-grained, dark chocolate brown, containing muscovite mica and an occasional brachiopod shell, very calcareous	1632.30-	1632.33
.57	Shale, gray	1632.33-	1632.90
.03	Shale, gray, with interbedded very fine-grained, dark brownish gray sandstone	1632.90-	1632.93
2.12	Shale, gray	1632.93-	1635.05
.05	Sandstone, very fine-grained, dark chocolate brown, somewhat micaceous, with some interbedded gray shale at top - good oil saturation and some gas	1635.05-	1635.10
.20	Shale, gray	1635.10-	1635.30
.07	Sandstone, very fine-grained, dark chocolate brown - good oil saturation	1635.30-	1635.37
1.13	Shale, gray	1635.37-	1636.50
.05	Sandstone, very fine-grained, dark chocolate brown - good oil saturation	1636.50-	1636.55
.15	Shale, gray	1636.55-	1636.70
.05	Shale, gray, sandy, with some interbedded very fine-grained, dark gray, micaceous sandstone	1636.70-	1636.75
.85	Shale, gray	1636.75-	1637.60
2.40	Sandstone, very fine-grained, dark chocolate brown, micaceous - good show of oil and considerable gas	1637.60-	1640.00
.05	Shale, gray	1640.00-	1640.05
.25	Sandstone, very fine-grained, dark chocolate brown, micaceous - good oil saturation	1640.05-	1640.30

Higgins Estate No. 1 Well

Thickness Feet	Description of Strata	Depth in feet Top	Bottom
.10	Shale, gray	1640.30	1640.40
.60	Sandstone, very fine-grained, dark chocolate brown, micaceous	1640.40	1641.00
.10	Sandstone, very fine-grained, dark chocolate brown, somewhat micaceous, with a few interbedded gray shale seams	1641.00	1641.10
4.65	Sandstone, very fine-grained, dark brownish gray, micaceous and somewhat argillaceous-good oil saturation	1641.10	1645.75
.20	Shale, gray	1645.75	1645.95
.05	Sandstone, very fine-grained, dark brownish gray	1645.95	1646.00
.90	Shale, gray	1646.00	1646.90
1.75	Sandstone, fine-grained, dark chocolate brown, with numerous interbedded thin seams of gray shale - very fossiliferous	1646.90	1648.65
.70	Sandstone, very fine-grained, dark chocolate brown, micaceous, with occasional interbedded very thin seams of gray shale	1648.65	1649.35
.30	Sandstone, very fine-grained, dark chocolate brown	1649.35	1649.65
.10	Shale, gray	1649.65	1649.75
.50	Sandstone, fine-grained, dark chocolate brown	1649.75	1650.25
.15	Sandstone, fine-grained, dark chocolate brown, with some interbedded thin seams of gray shale	1650.25	1650.40
.10	Shale, gray	1650.40	1650.50
.15	Sandstone, fine-grained, dark chocolate brown, with some interbedded thin seams of gray shale	1650.50	1650.65
.20	Shale, gray	1650.65	1650.85
1.00	Sandstone, fine-grained, dark chocolate brown, with occasional interbedded thin seams of gray shale	1650.85	1651.85

Higgins Estate No. 1 Well

Thickness Feet	Description of Strata	Depth in feet Top	Bottom
.40	Shale, gray	1651.85	1652.25
.10	Sandstone, very fine-grained, dark chocolate brown, with some interbedded gray shale	1652.25	1652.35
.40	Sandstone, very fine-grained, mottled dark brownish gray, somewhat argillaceous	1652.35	1652.75
.30	Sandstone, very fine-grained, greenish gray, somewhat argillaceous	1652.75	1653.05
.60	Shale, gray, with occasional interbedded thin seams of very fine-grained, dark chocolate brown sandstone	1653.05	1653.65
.20	Sandstone, very fine-grained, dark chocolate brown	1653.65	1653.85
.25	Sandstone, very fine-grained, dark chocolate brown, with some interbedded seams of gray shale	1653.85	1654.10
.40	Sandstone, very fine-grained, dark gray	1654.10	1654.50
.15	Shale, dark gray	1654.50	1654.65
.20	Sandstone, very fine-grained, dark gray to brownish gray	1654.65	1654.85
.45	Shale, dark gray, with occasional interbedded thin seams of very fine-grained dark chocolate brown sandstone	1654.85	1655.30
.10	Sandstone, very fine-grained, dark chocolate brown	1655.30	1655.40
.10	Shale, dark gray	1655.40	1655.50
.10	Sandstone, very fine-grained, dark chocolate brown	1655.50	1655.60
.50	Sandstone, very fine-grained, dark chocolate brown, with some interbedded seams of dark gray shale	1655.60	1656.10
.95	Shale, gray, with occasional interbedded thin seams of very fine-grained dark chocolate brown sandstone	1656.10	1657.05
.60	Sandstone, very fine-grained, mottled brownish gray	1657.05	1657.65

Higgins Estate No. 1 Well

Thickness Feet	Description of Strata	Depth in feet Top	Bottom
.35	Shale, dark gray, with some interbedded thin seams of dark brownish gray sandstone	1657.65	1658.00
.80	Sandstone, very fine-grained, dark brownish gray, somewhat fossiliferous in upper part, with some interbedded thin seams of dark gray shale	1658.00	1658.80
.40	Coquinite, gray, sandy	1658.80	1659.20
.20	Sandstone, very fine-grained, dark brownish gray	1659.20	1659.40
.30	Sandstone, very fine-grained, dark brownish gray, with some interbedded thin seams of dark gray shale	1659.40	1659.70
.30	Sandstone, very fine-grained, dark brownish gray	1659.70	1660.00
.15	Shale, dark gray, with some interbedded thin seams of dark brownish gray siltstone	1660.00	1660.15
.15	Sandstone, very fine-grained, dark brownish gray	1660.15	1660.30
.60	Core lost	1660.30	1660.90
.20	Sandstone, very fine-grained, dark gray	1660.90	1661.10
4.90	Shale, gray to dark gray, with an occasional interbedded thin seam of very fine-grained dark gray sandstone	1661.10	1666.00
3.30	Shale, gray to dark gray	1666.00	1669.30
.20	Sandstone, fine-grained, dark gray, calcareous	1669.30	1669.50
1.60	Shale, gray to dark gray	1669.50	1671.10
1.60	Shale, dark gray	1671.10	1672.70
.10	Sandstone, very fine-grained, brownish gray, calcareous	1672.70	1672.80
5.40	Shale, dark gray	1672.80	1678.20
.05	Sandstone, very fine-grained, dark brownish gray, hard	1678.20	1678.25

Higgins Estate No. 1 Well

Thickness Feet	Description of Strata	Depth in feet Top	Bottom
1.05	Shale, dark gray	1678.25	1679.30
.05	Sandstone, very fine-grained, brownish gray, hard	1679.30	1679.35
1.35	Shale, dark gray, with occasional interbedded thin seams of very fine-grained, dark gray sandstone	1679.35	1680.70
.10	Sandstone, very fine-grained, dark brownish gray, somewhat micaceous	1680.70	1680.80
.01	Shale, gray, sandy	1680.80	1680.81
.59	Sandstone, very fine-grained, dark brownish gray, somewhat micaceous	1680.81	1681.40
.75	Shale, dark gray	1681.40	1682.15
.10	Sandstone, very fine-grained, dark brownish gray	1682.15	1682.25
.85	Shale, dark gray	1682.25	1683.10
.20	Sandstone, very fine-grained, dark brownish gray, hard, very fossiliferous in lower part, with occasional interbedded thin seams of gray shale	1683.10	1683.30
.70	Shale, dark gray	1683.30	1684.00
.80	Sandstone, very fine-grained, very dark brownish gray, with some interbedded gray shale - good oil show	1684.00	1684.80
.05	Shale, gray	1684.80	1684.85
.40	Sandstone, very fine-grained, very dark brownish gray, hard	1684.85	1685.25
.41	Shale, gray	1685.25	1685.66
.04	Sandstone, very fine-grained, very dark brownish gray, calcareous	1685.66	1685.70
.70	Shale, gray	1685.70	1686.40
.10	Sandstone, very fine-grained, very dark brownish gray, hard - good oil saturation	1686.40	1686.50
.25	Shale, gray	1686.50	1686.75

Higgins Estate No. 1 Well

Thickness Feet	Description of Strata	Depth in feet Top	Bottom
.15	Sandstone, very fine-grained, very dark brownish gray, hard - good oil saturation	1686.75	1686.90
.10	Shale, gray	1686.90	1687.00
.10	Sandstone, very fine-grained, very dark brownish gray, hard - good oil saturation	1687.00	1687.10
.70	Shale, gray	1687.10	1687.80
.15	Sandstone, very fine-grained, very dark brownish gray, hard, cross-bedded, with some interbedded gray shale	1687.80	1687.95
.95	Shale, gray, in part sandy	1687.95	1688.90
.60	Sandstone, very fine-grained, mottled greenish gray and dark brownish gray, somewhat calcareous	1688.90	1689.50
.50	Shale, gray	1689.50	1690.00
1.40	Shale, gray, in part sandy, with occasional interbedded thin seams of very fine-grained, dark brownish gray sandstone	1690.00	1691.40
.30	Sandstone, very fine-grained, dark brownish gray, calcareous, with some interbedded gray shale	1691.40	1691.70
.30	Shale, gray	1691.70	1692.00

An examination of the section of the Haskell sand as developed in the Higgins Estate No. 1 Well reveals that the sand body can be divided into three parts; an upper sandy zone extending from 1637.6 to 1660.3 feet, a middle shaly zone extending from 1660.3 to 1680.7 feet, and a lower sandy zone extending from 1680.7 to 1687.1 feet.

In the total thickness of 22.7 feet comprising the upper sandy zone 14.15 feet consist of oil-bearing sandstone. The sand body below a depth of 1651.85 feet, however, is interbedded with shale, which predominates, and the sand layers that are present have porosities of less than 10 percent and permeabilities of only .6 millidarcies or less. This part of the section, therefore, will not contribute any significant quantity of oil. The main pay zone is confined to the 14.25 feet between 1637.6 and 1651.85 feet. This interval contains a net thickness of 10.8 feet of oil-bearing sandstones. Permeabilities in this interval range from a minimum of 1.5 millidarcies to

Table 1. CORE DATA.*

Fralich and Stengel
Higgins Estate No. 1

Coryville Pool, Keating Twp., McKean Co., Pa.

Depth feet	Permeability, millidarcies	Porosity, percent	Saturation, per cent pore volume		Oil content, bbl. per acre-foot	Chloride content of water in core samples, parts per million.
			Oil	Water		
1638.00		15.76	21.92	42.08	268	
1638.40	20.7					
1638.90		12.80	33.40	41.95	332	
1639.25	1.8					
1639.70	2.5					
1639.80		13.18	21.64	34.28	221	39,508
1640.80		10.89	28.67	53.86	242	
1641.10	6.5					
1642.20		14.61	33.78	32.85	383	
1642.90	9.7					
1643.30		15.96	34.66	55.33	429	
1643.50	4.4					
1644.60	6.3	15.23	37.32	47.49	411	
1645.30	9.6					
1645.50		14.26	25.65	25.68	284	35,807
1648.80	4.8					
1649.00		13.17	25.33	23.34	259	
1649.30	4.2					
1649.60		10.38	42.89	44.01	345	47,346
1651.10	1.5					
1651.30		9.93	23.34	67.60	180	
1654.20	0.4	5.92	9.79	81.11	42	
1656.90		6.76	32.51	46.64	171	36,504
1657.20	0.4					
1659.30	0.6	4.97	54.97	35.94	212	
1681.00	1.1	9.12	24.21	32.77	171	
1685.00	0.6	7.64	21.51	24.54	128	59,227

*De terminations by E. M. Tignor, Petroleum Engineer
U. S. Bureau of Mines.
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a maximum of 20.7 millidarcies; porosities from 9.93 percent to 15.96 percent; and oil saturations from 21.64 percent to 42.89 percent.

The core analysis shows a total oil content of 3400 barrels per acre for the above interval. If a final residual saturation of 25 percent is assumed, 700 barrels of this oil are recoverable. On the basis of a 22 percent residual saturation, 1000 barrels are recoverable. The texture of the sand is somewhat finer than that of typical Bradford Third sand, but permeabilities and porosities are comparable. The oil saturations obtained are lower than those exhibited by Bradford Third sand samples from good water-flooding territory, but it is believed that this may be due in part at least to the fact that the Haskell sand core was taken in an area where the reservoir pressure was still several hundred pounds above atmospheric as compared with Bradford Third sand cores which are usually taken in areas where the reservoir pressure has been reduced almost to atmospheric pressure. An appreciably greater loss of oil probably occurred in taking the Haskell sand core. It is likely, therefore, that the figures given above for total oil present and recoverable oil are too low.

On account of its extremely fine texture and low permeability, it is not likely that the Haskell sand would respond to a gas-drive. On the other hand, the sand should be amenable to water-flooding where it has sufficient thickness. Water-flooding may prove to be economically feasible over limited portions of the pool, provided the original wells can be used. In laying out a drilling program, therefore, this should be kept in mind and the well spacing arranged accordingly.

The 6.4 feet comprising the lower sandy zone contain only 2.14 feet of oil-bearing sandstone of relatively low permeability, porosity and oil saturation. It is questionable whether any appreciable percent of its oil is recoverable.

Table 1 shows that the chloride content of the water in the core samples ranges from 35,807 to 59,227 parts per million. This is between one-half and three-fourths of the amount present in connate waters occurring in the Bradford Third and Kane sands, whose compositions and concentrations are very similar. No analysis of connate water from the Haskell sand is available for comparison. Assuming that it is similar, between one-half and three-fourths of the water present in the core samples represents connate water. The balance was introduced during the coring operation as fresh water has not had access to the Haskell sand in the area where the core was taken.